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ABSTRACT

Historically, data have been collected from survey participants through a paper-and-pencil questionnaire or through interviews in person or on the telephone. This study compares the use of a new approach, interactive telephone data collection (ITDCT) to traditional paper-and-pencil collection. ITDCT administers survey items through a digitized human voice using a computer software program. Respondents enter their responses by pushing telephone keypad numbers. From an initial sample of 5,908 students, data about the community and campus environment were collected from 867 undergraduates though a questionnaire and from 666 through ITDCT. The overall response rate was relatively low because of the timing (last week of the semester) and some problems with the ITDCT system. Although there were significant differences between the two survey types, when the data were inspected by plotting the means and standard deviation, one could see the statistical differences as a result of the large sample size and the power of the tests--small degrees of freedom in the numerator with large degrees of freedom in the denominator. No patterns suggested that social context effects played a role in item responses by survey type. Findings were not sufficient to demonstrate whether ITDCT is really a good substitute for a paper-and-pencil questionnaire, but they do suggest the usefulness of the technique for a short questionnaire. (Contains 2 tables, 11 figures, and 12 references.) (SLD)

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Research Methodology in the Information Age:

A Comparison of Two Survey Techniques

By

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Research methodology in the information age: A comparison of two survey techniques

Survey research started in the 1930's when the "big three" pioneer commercial polling organizations went door to door gathering data to predict presidential elections, women's rights, or other timely topics of interest (Glenn, 1995). Seventy years later, as we enter the 21st century, technology has propelled survey research into new arenas of data collection. What was once a tedious, labor intensive process with various interviewer and responder effects has now become more user friendly entailing fewer biases.

One of the most important innovations for telephone surveys was random digit dialing. This technology increased the effectiveness of telephone sampling and implementation. Shangraw (1986, p. 108) reported, "The University of Wisconsin's Survey Research Laboratory estimated that an experienced computer assisted telephone interview (CATI) interviewer's productivity may be as much as 20% higher than that of the same interviewer using traditional survey methods." This technology, along with various other changes in survey research, will continue to change the way universities, researchers, and marketers design, implement, and analyze surveys.

Historically, we have collected data from survey participants using one of two primary methods. We can ask survey participants to complete a paper and pencil questionnaire or we can conduct interviews in one of two ways: (1) face-to-face or (2) over the telephone using trained telephone survey interviewers (Bradburn & Sudman, 1982). In recent years, three various techniques have been employed to effectively collect survey responses: (a) computer-administered questioning (CAQ)--respondents directly answer questions posed on computer monitors (Liefeld, 1988, p.405); (b) computer assisted personal interviewing (CAPI) or computer assisted telephone interview (CATI)--the computer randomly dials the phone number and leads the interviewer through the survey questions, then the interviewer enters the responses directly into the computer; and, (c) automatic dialing and announcing device (ADAD)--completely automated system where the

computer dials the preselected phone numbers and tapes the responses to each question thus eliminating the need for an interviewer (Dickinson et al., 1990, p. 28).

Only recently, has the technology for a fourth survey data collection technique emerged. The interactive telephone data collection technique (ITDCT) was developed to administer survey items using a digitized human voice, through a computer software program (Hanson & Ouimet, 1994). The digitized voice asks the respondents a question and then provides a list of possible coded responses. The survey participants indicate their response to each survey question by pushing one of the numerical telephone numbers that correspond to a coded response. For example, press a "1" if your answer is yes or press a "2" if your answer is no. The response is directly entered into a flat file, thus eliminating the need for data entry. The ITDCT is not limited to pre-coded data. Open-ended questions can be administered by leaving a voice mail message.

As with all new techniques, one has to look at the usefulness and practicality of this innovative type of system. In addition, the validity of this technique has to be explored. Questions such as what type of item questions and responses are conducive to the ITDCT method? Do people respond differently using the ITDCT then the traditional paper pencil technique? Is the ITDCT a suitable substitute for the traditional paper-pencil technique? All of these questions need to be addressed before researchers adopt the present technique.

A brief overview of the ITDCT system follows. This overview contains an explanation of how the system works, as well as some pros and cons on the issue, and finally, the administrative advantages and disadvantages one might expect.

Bradburn (1983, p. 289) and Kiesler (1990, p. 404) suggest that one way to determine the comparability issue of survey methods is to look at response effects. Response effects occur when participants refuse to answer certain questions, give incomplete responses, do not follow directions, yea-say, under report or over report socially sensitive information, and choose neutral categories. The last two are categorized as social context effects. The more disconnected a participant is from personal interaction

with the interviewer, survey researcher, etc., the more likely the social context effect will be reduced thus, decreasing the response effect.

There are many considerations to take into account when assessing the utility of the ITDCT. Among them are 1) comparability to other methods of survey administration, 2) ease of participation, and 3) economic advantages. For the purposes of this paper, the traditional paper-pencil survey method is used for the comparison.

The ITDCT has similar qualities to that of the paper-pencil instrument in that both are self-administered questionnaires. In addition, both offer a relatively anonymous response environment which reduce the phenomenon of social context effects. Finally, both techniques lack the opportunity for the respondent to request question clarification.

Kiesler & Sproull believe "The electronic survey is also unique because of the degree to which it lacks social context information (1986, p.405)." Their research suggests that electronic surveys make a research setting more impersonal and anonymous and, in so doing, reduces social context effects. As a result, Kiesler & Sproull support the theory that survey subjects become more "self-centered and relatively unconcerned with social norms as well as the impressions they give others" (1986, p. 405).

The ITDCT is designed to emulate an electronic survey, which can reduce social context effects. Thus, there is the belief that the social context information can be controlled using the ITDCT. The ITDCT respondents have been hypothesized as likely to give item responses that are unaffected by either interviewer effects or the participant's desires to give a socially acceptable response rather than reveal true responses.

The ITDCT is designed to permit the respondent to answer questions as if they were self-administered. This provides a venue similar to that of the paper-pencil survey in that there is a constant and unwavering presentation of questions, thus eliminating interviewer effects; however, there is no opportunity for item clarification. Since there is no opportunity to clarify an unclear question the participant must consider the literal

interpretation of all questions in any self-administered anonymous survey method (Havice, p. 100).

An important consideration when implementing surveys is the ease of participation. Filling out surveys and returning them can be perceived as a nuisance. Phone solicitation can also be annoying and inconvenient. With the ITDCT , however, the participant initiates the call when s/he has the time or inclination to do so. This method of data collection will become more popular as people become more acclimated to getting information using automated telephone technology--i.e. retrieving checking account balances, flight arrivals and departures, etc., responding to questionnaires will be the next logical progression.

The primary economic advantage is cost. In the education environment, if the institution is set-up with a computerized registration system, then the initial costs will be minimum. The savings accrued on printing costs, return postage, data entry and correction, and data preparation will help counter start-up costs. The disadvantages pertain to the format restrictions, initial development and start-up costs if hardware is not in place, and technical problems.

ITDCT Mechanics

To understand better how the ITDCT works, see Figure 1. Essentially, the survey questions and responses are digitized and a translation table is created. ITDCT requires the respondent to provide answers by pressing the numbers on their touch-tone telephone keypad. During the study, respondents with dial telephones or those who do not have telephones were instructed to use campus phones. The other steps are very similar to other self-administered survey. The main difference is in the data capture step. In the ITDCT method, the data are captured instantaneously and placed on a flat file to be analyzed at anytime. In the mail survey, more time is spent in data entry than in any other aspect of the survey process.

ITDCT Advantages

In the ITDCT, responses are entered via the telephone keypad and are automatically entered into a computer file, eliminating the need for data entry. This streamlining results in a reduction of data entry error because the data are entered in by the respondent. This is accomplished by having the respondent press the number directly; however, if the number is not within the response, the ITDCT will restate the question prompting the respondent to re-select a response. Another benefit of this type of data collection is that it permits data to be immediately stored in a form which is easily and quickly assessable to statistical analyses thus decreasing time needed to accomplish the analysis and reporting.

The ITDCT provides a more systematic way to respond to questions. The respondent is led through one question at a time, instead of being overwhelmed with numerous questions. This method can insure that all items are in fact answered because the program does not proceed to the next question until the previous one has been answered. There is, however, the option of skipping a question by pressing '0'.

Complex branching is another important feature of this system. The ITDCT will automatically administer the proper question with regard to the previous response. For example, the question "Have you ever been harassed or discriminated against due to your gender? " If the responds was 'yes', then questions pertaining to the type, place, form, etc., would be asked; however, if the responds was 'no', then the ITDCT branched to another topic question. Using the ITDCT assures the removal of interview effects due to the lack of non-verbal communication between the respondent and interviewer.

ITDCT Disadvantages

As with all survey methodologies, there are drawbacks to this method of data collection as well. First, there are format restrictions. Consistency in the scale order, either descending or ascending, is imperative when a Likert scale is used. The response categories or choices need to be short and concise. For instance, the first question on the ITDCT survey originally asked participants which definition of community best described

their image of campus community. The definition choices were so long that discerning one definition from another was difficult. This was discovered in the pilot test when subjects informed us that the question was very tedious and difficult to follow. The fear that subjects would become uninterested and hang-up, resulted in that item being dropped from the ITDCT survey and left on the mail survey.

The second restriction, closely related to the first, is the ITDCT does not permit respondents to edit their answers after they respond to all items. A respondent could change his/her response only by calling back and having the ITDCT re-administer the survey. A call back results in all previous responses being overwritten with the new. While this insures that one subject does not bias the results with multiple responses, the responses may be quite different from the original.

The third restriction is the survey length. Respondents must listen and respond to the questions, which takes longer than reading and responding. Therefore, the total number of questions that can be asked is limited.

The fourth restriction is the developmental costs. The initial outlay of purchasing the hardware and having the software designed for the specific hardware, can be quite expensive and a major deterrent to implementing this type of data collection. For instance, we had 30 people call exactly at the same time to see what would happen to the system; none of the subjects had any problems getting through. Unfortunately, the first day major glitches occurred resulting in many technical obstacles, which needed to be addressed and fixed.

Method

Sample Demographics

Data were collected from a stratified random sample of 5,908 currently enrolled male and female undergraduate students during the 1993-1994 academic year. The sample was then divided into two sub samples: (1) traditional paper-pencil survey (N=1,968) and,

(2) interactive telephone data collection technique (ITDCT) (N=3940). A total of 1,533 students participated in the survey (26%).

The target paper-pencil sample included approximately 200 students in each of the following ethnic-gender categories: White, African-American, Hispanic, Asian-American, and foreign. A total of 867 students returned the paper-pencil survey (44%). The ethnic-gender (male/female) breakdown was: White-85/100, African-American-53/85, Hispanic-82/98, Asian-87/106, and International-102/69.

The ITDCT survey included approximately 800 students in each of the same ethnic categories. A total of 666 students responded to the telephone survey with a 17% response rate. The ethnic breakdown for the telephone survey was: White-75/100, African-American-45/67, Hispanic-60/77, Asian-American-61/72, and Foreign-67/42.

The low response rate was attributable to both the time of year the survey was administered and problems with the ITDCT. The survey was disseminated the last week of the semester and during the final exam period. Due to this busy time the response rate was lower than usual for the paper-pencil survey. The even lower response rate for the ITDCT survey was confounded by the systems hardware and software problems.

Insert Table 1 about here

Given the low response rate to the surveys, we wanted to compare the responders to the overall university population. Suskie (1992) suggested that a quality representation is more important than a high yield rate that is disproportional to the underlying population. Gender, race/ethnicity, and college will be used for comparison and will be described.

In table 1, we compared the survey response rates to the University's undergraduate population. Women responded at a higher rate than did men. Of the students who responded to the surveys, 46 to 47% were males and 53 to 54% were females, which is the opposite of the institution's population. The study sample was representative in respect to class level with no differences larger than 5%. As a result of the stratification, the sample was not representative of the underlying student population

with respect to ethnicity. In the mail survey, each ethnic group had at least a 20% representation except for the African Americans who were underrepresented by 4%; however, the ITDCT had fewer International students responding. Overall, the participants were representative of the undergraduate population by college with two exceptions. In the ITDCT sample, engineering students responded at higher rate (21%) than are representative of the population (14%) and liberal arts majors responded at a lower rate (24% responded, 29% in population).

Measures

We used selected items from a survey developed at The University of Minnesota (Harrold, Hendel, Melton and Scouten, 1991) to measure students' definitions of community, the importance of and the extent to which they experienced community, and the experiences of gender and racial discrimination and harassment on campus.

The campus community survey consisted of two parts: 1) The University as a Welcoming Environment, and 2) Campus Diversity Experiences. A total of 37 possible questions[1] with multiple responses were presented. Seven questions, each were asked in each of the following categories: community experiences, satisfaction of community, student organization memberships, time spent on campus outside of class, approachability of faculty, and gender and racial discrimination or harassment. An open-ended question to provide an opportunity for students to offer suggestions on how to improve diversity and campus community was also asked.

Data Collection

A three-stage mailing was conducted, as suggested by Dillman (1978), between November 1993 and January 1994. Each mail survey included a postage paid return envelop for convenience. A cover letter on University letterhead was attached to the survey

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[1] In the telephone survey these questions were in the form of dichotomous questions, which actually increased the total possible questions to 72.

informing each student the survey's nature and purpose. A reminder letter was sent the first week of December to increase the response rate. In mid-January a third reminder letter and a second copy of the survey was mailed.

For the ITDCT survey a three-stage mailing was used; however, enclosed in the first mailing was a letter of invitation to participate in the ITDCT technique. The letter had specific instructions as to how to access the ITDCT, a phone number for both on and off campus use, a survey-number, a unique-number which was used to collect demographic information, and rudimentary directions. As with the mail survey, a third letter was sent in mid-January to invite these students to participate in the ITDCT survey.

Purpose

The purpose of this study was to explore whether students responded differently by survey type. We were particularly interested in the following research questions: Are there gender, ethnic and class interactions across type of survey? Does "method" variance account for more of the item distribution variance than does gender, class, and ethnic variance? To answer these questions we used linear models, ANOVA, and mean comparisons.

Results

First, we applied a linear models approach utilizing the PROC REG procedure in SAS. The four attribute model had race, class, gender, and survey type. This model contained 11 parameters: race (White, Hispanic, Black) had three levels, class (freshmen, sophomore, junior, senior) had four levels, gender (male, female) and survey type (mail, telephone) each had two levels (or a 3 by 4 by 2 by 2 block ANOVA). We then used a TEST statement in the PROC REG procedure to test the following hypothesis:

Ho 1: Students respond the same to paper-pencil and ITDCT survey items.

Ho 2a: Women respond the same as men respond to mail and ITDCT survey items.

Ho 2b: Men respond the same to paper-pencil and ITDCT survey items.

Ho 3a: African Americans respond the same to paper-pencil items as they do to ITDCT survey items.

Ho 3b: Hispanics respond the same to paper-pencil and ITDCT survey items.

Ho 3c: Caucasians respond the same to paper-pencil and ITDCT survey items.

Ho 4: All within class levels respond the same to paper-pencil and ITDCT survey items.

Ho 5: All within group gender by ethnic respond the same to paper-pencil and ITDCT survey items.

Findings

In this section, comparisons between the paper-pencil instrument and the ITDCT are made on the basis of mean differences by item response, gender, race, class, and gender by race.

Results of this study demonstrate significant differences ($p<.01$) between the two methods in some item responses. Due to the shear number of in the sample, significant differences will occur. Nevertheless, some variables did not demonstrate significant differences nor did they demonstrate practical significance. Table 2 shows the various statistical differences by race, gender, class, and survey type. As a result of these statistical findings, we decided to plot the means and standard deviations and to examine both pattern differences (statistical significance) and practical significance simultaneously..

Insert Table 2 about here

We chose eight questions of various social context sensitivity and plotted the survey type means and standard deviation. To see if there are differences by gender, ethnic, class, and gender by ethnic we plotted the means of each group to ascertain if they fell within a .5 standard deviations interval above or below the overall item means. This plot provides a visual display mapping the relationship between the similarity of item response by survey type. Data in Figures 2 through 5 show that there really were not any practical

item response differences by survey type, although it is easy to see differences by gender, ethnic and class.

A cursory look at the significant differences by item response provided no patterns with respect to social context effects. Two perceived socially sensitive questions concerning gender and racial harassment were asked. The mean for the gender harassment item (Figure 2 & 3) was statistically significant by survey type ($F[1, 1480] = 11.05$, $p < .001$) but the mean for the racial item (Figure 4 & 5) was not (telephone M=1.62, mail M=1.65). A quick look at figures 2 and 3 indicate there was virtually little survey type and item response difference; yet, statistically there was a difference. Other items that were considered less socially sensitive (see Figures 6 to 11) such as, experience community ($F[1, 1480] = .95$, NS), time spent on campus ($F[1, 1480] = .21$, NS), importance to experience a sense of community ($F[1, 1480] = 48.76$, $p < .001$), and satisfied with experiences ($F[1, 1480] = 14.10$, $p < .001$) were also found not to be practically significant by survey type.

In Figure 8 and 9 one can see that Black and Hispanic females have slight item response differences (Black: telephone M=2.34, mail M=2.59; Hispanic: telephone M=2.51, mail M=2.72) than did White females (telephone M=2.47, mail M=2.45), these difference though, were not statistically significant.

In the gender discrimination item, figures 2 and 3, which were statistically significant by survey type, there were slight practical significance's. Once again, Black females and Hispanic females responded differently (Black: telephone M=1.58, mail M=1.69; Hispanic: telephone M=1.71, mail M=1.79) than did the other gender by ethnic groups. There were also slight practical differences for men (telephone M=1.84, mail M=1.93) and for sophomores (telephone M=1.87, mail M=1.74).

We also looked at the R-square by item for the full model (race, gender, class, and survey type). For five of the eight questions, the R-square was less than .10 with the largest R-square value of .20 on the racial discrimination and harassment question.

Discussion

The purpose of this study was to: 1) determine whether these self-administered methods produced similar responses and, 2) determine whether the ITDCT is a viable alternative to the self-administered paper-pencil technique.

Significant differences between the two survey types emerged; however, when visually inspected by plotting the means and standard deviation, one could see the statistical differences were a result of the large sample size and the power of the tests--small degrees of freedom in the numerator with large degrees of freedom in the denominator.

When we compared the differences by item sensitivity we found no patterns that would suggest social context effects played a role in the item responses by survey type. Only one of the two questions that dealt with discrimination and harassment was statistically significant; yet, if one compared the means and standard deviations of each question, the practical significance was minimal. Recall also due to the number of tests conducted, it is possible that significant results can emerge by chance in this context (Type I error).

We also wanted to know if there were response differences within gender, ethnic, and class level. For brevity , we included only four item responses. Figures 2 through 4 show the different item means by overall, gender, race, and class. One can quickly see the mean differences within each category are less than .5 standard deviations from the overall mean supporting the hypothesis of no difference by survey type.

We also looked at the statistical differences to see if there were survey type pattern differences. We saw no consistent patterns. The differences seemed to be erratic, flipping from one question to another. Kiesler and Sproull had similar findings when they compared electronic survey responses to those administered in an equivalent paper-pencil method (1986, p 403-404). They predicted specific differences between these instruments, but their research found ". . . considerable similarity of response between the paper and

electronic survey but not so much that the two may be considered interchangeable without further research" (1986, p. 402-413).

In contrast to Kiesler and Sproull (1986), we had hypothesized there were no practical or significant differences across survey type. The validity of this finding, with less than a 17% response rate for the ITDCT, even though we had a sample of 666, must be questioned. It is difficult to determine whether these two methods really do produce similar responses. We suggest further studies be implemented to explore the usefulness and reliability of the ITDCT.

The question of whether the ITDCT is a viable alternative to the self-administered paper-pencil technique is two-fold. First, the results from this study appear to illustrate that social context effects do not differ from one self-administered instrument to the other. We did not see any consistent differences across survey type which suggests an absence of social context effects. Kiesler and Sproull (1986) "espoused that self-administered questionnaires are relatively anonymous and tend to reduce respondent's concern of over presenting themselves in a good light (p.405)." This is important to researchers when the information gathered is of a sensitive nature. Having another tool available, like the ITDCT, will facilitate research of this type.

The second consideration, is the importance of item response construction for automated surveys. Havice and Banks (1990) found that for automated surveys careful construction was crucial. One reason for this is the lack of question clarification. Without the opportunity to clarify, a misinterpretation that could end in erroneous results might occur. This problem is not distinctive to the ITDCT, but is also a concern in the paper-pencil instrumentation as well. " It is also worth noting that a self-completion questionnaire does not avoid most of the sources of error such as questions being abbreviated, misread, omitted in error, or the routing may be incorrectly followed." (Berry O'Brien, 1978, p. 235)

A third consideration to the ITDCT is the necessity of keeping questions and responses short and clear. The longer the question, the more likely a participant is to not understand what is being asked. The effects of double-barreled questions, leading questions, or loaded questions would be enhanced because of the inherent confusing nature of those types of questions.

Is the ITDCT a viable alternative to the self-administered paper-pencil instrument? As with many areas of study, the answer is it depends. As mentioned above, our findings are insufficient to truly determine whether this technique is a good substitute, however, we believe the ITDCT could be a useful tool in various situations. This technique would be an excellent tool for a short survey. One that has approximately 20 true/false or Likert scale responses and can be completed in no more than 10 minutes. The data could be down loaded and analyzed within a day after survey participation was completed. In fact, if the statistical code was written ahead of time, analyses could be run at any point during data capture.

In times where research funds are decreasing, researcher must find innovative ways to streamline data collection techniques and more importantly reduce costs. One possible way this can be done is by using the ITDCT system. More research needs to be implemented to determine whether the ITDCT is a suitable and practical substitute for the present techniques of data collection.

Questions for Future Studies

As indicated in the research there are limitations to this new technique; many other studies will be required to determine its validity. To determine whether the ITDCT is, in fact, a viable addition to survey methodology further investigation is required.

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Table 1

A Comparison of the mail and telephone respondents with the U-Texas Undergraduate Student Population

	Mail Responders		Phone Responders		UT Undergrad	
	N	%	N	%	N	%
Gender						
Men	409	47%	308	46%	18,509	53%
Women	458	53	358	54	16,697	47
Class						
Freshmen	191	22	151	23	7,217	21
Sophomore	152	17	151	23	6,767	19
Junior	204	24	147	22	7,710	22
Senior	320	37	217	33	13,512	38
Race						
White	185	21	175	26	23,673	67
African American	138	16	112	17	1,449	4
Asian American	193	22	133	20	3,558	10
Hispanic	180	21	137	22	5,058	15
Foreign	171	20	109	16	1,342	4
College						
Architecture	5	1	1	<1	334	1
Bus Adm	123	14	109	16	5,123	15
Communication	67	8	56	8	2,912	8
Education	33	4	22	3	1,844	5
Engineering	144	17	140	21	5,091	14
Fine Art	22	2	17	2	1,520	4
Liberal Arts	229	26	157	24	10,277	29
Natural Science	200	23	137	21	6,717	19
Nursing	18	2	11	2	624	2
Pharmacy	19	2	12	2	491	1
Social Work	7	1	4	<1	273	1
Total	867	100%	666	100%	35,206	100%

Table 2

ANOVA Probabilities and f-tests by race, gender, class, and survey type and R-square for the university as a welcoming environment and discrimination and harassment (N=1533)

		Race		Gender		Class		Survey Type		R Sq.
	Question	F	Pr	F	Pr	F	Pr	F	Pr	
Q2	Extent it is important to experience a sense of community	3.47	0.008	9.62	0.002	1.75	NS	48.76	0.001	.09
Q3	Experience community	3.69	0.005	3.79	0.005	8.90	0.001	0.95	NS	.08
Q4	Satisfied with experiences	5.93	0.001	1.47	NS	3.24	0.022	14.10	0.001	.09
Q5	Involved in student organizations	8.73	0.001	2.77	NS	1.91	NS	4.91	0.027	.09
Q6	Time spent outside of class on campus	17.37	0.001	3.82	NS	7.45	0.001	0.21	NS	.12
Q7	Approaching faculty*	1.76	NS	1.83	0.023	4.11	0.007	16.78	0.001	.08
Q8	Gender discrimination/harassment	1.86	NS	63.73	0.001	2.43	0.064	11.05	0.001	.10
Q12	Racial discrimination/harassment**	53.06	0.001	0.14	NS	6.78	0.001	1.62	NS	.20

*Question 7 had a race by survey type interaction (f-value 2.67 pr>0.031).
**Question 12 had the following interactions. They are race by survey type (f-value 3.05 pr>0.016); gender by survey type (f-value 4.16 pr> 0.042); and race by gender by class by survey type (f-value 1.48 pr> 0.010).

Figure 1

How the ITDCT works

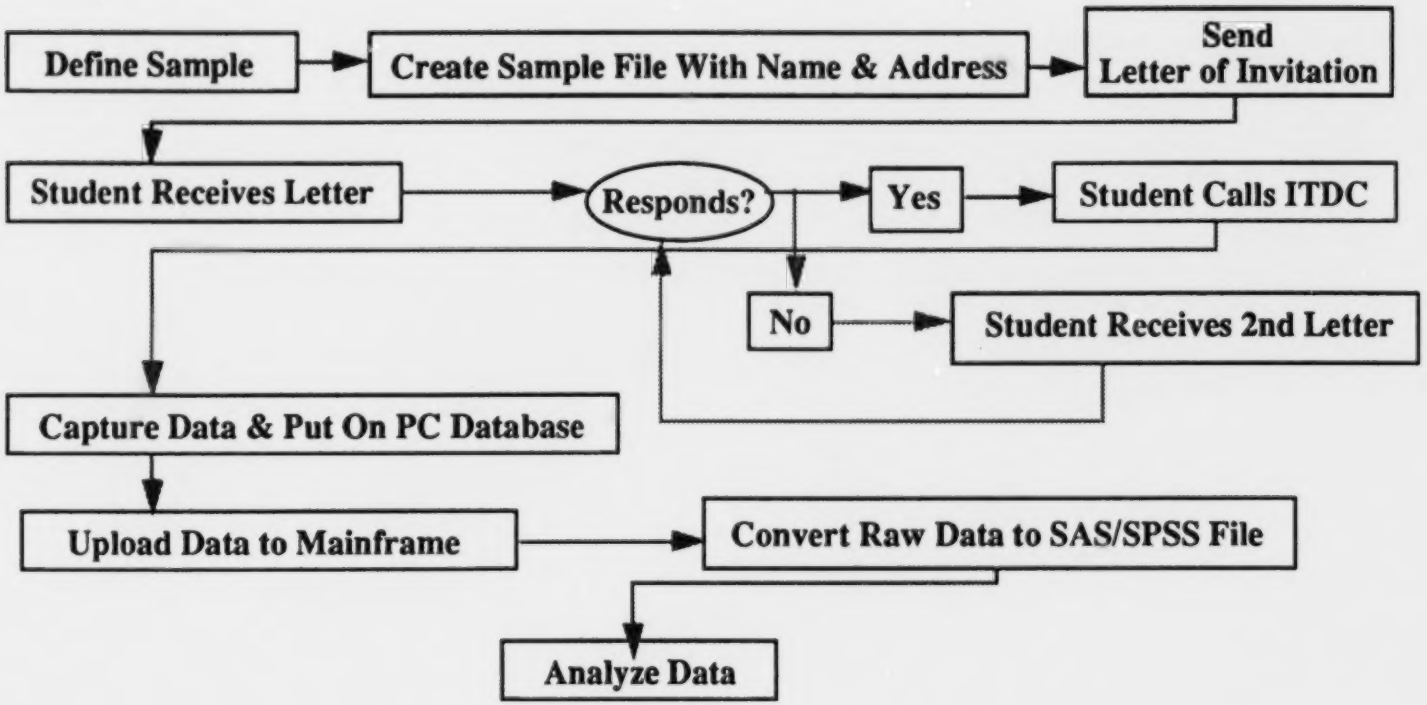


Figure 2

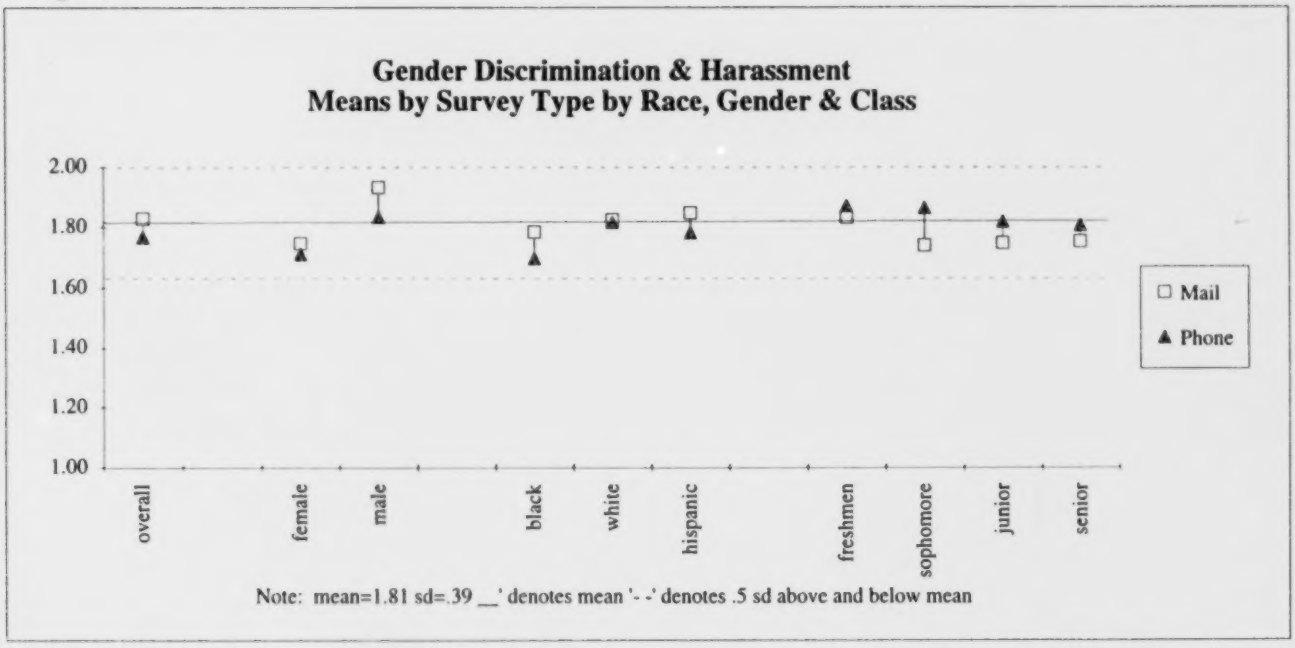


Figure 3

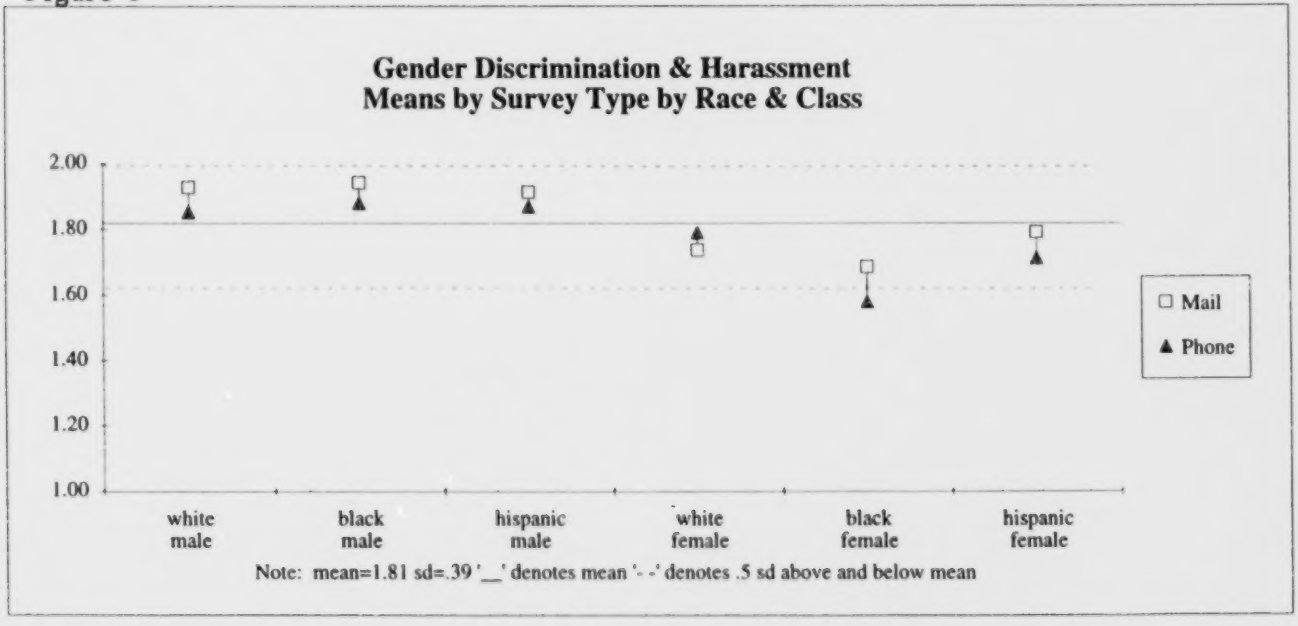


Figure 4

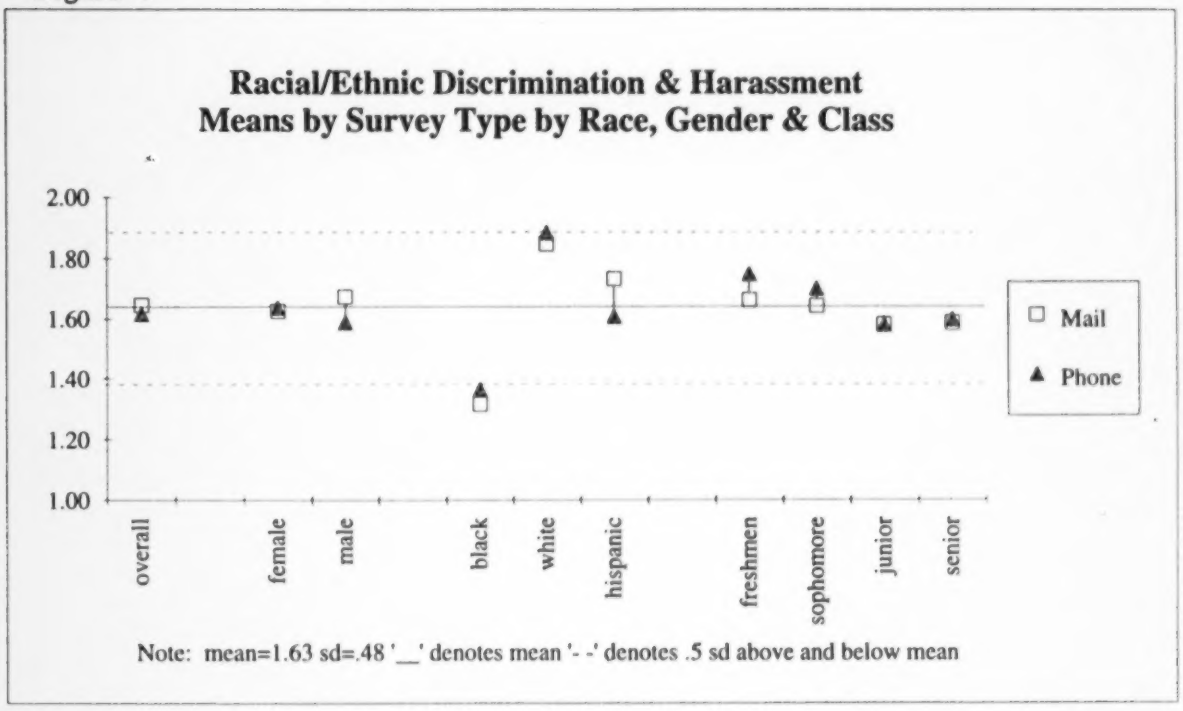
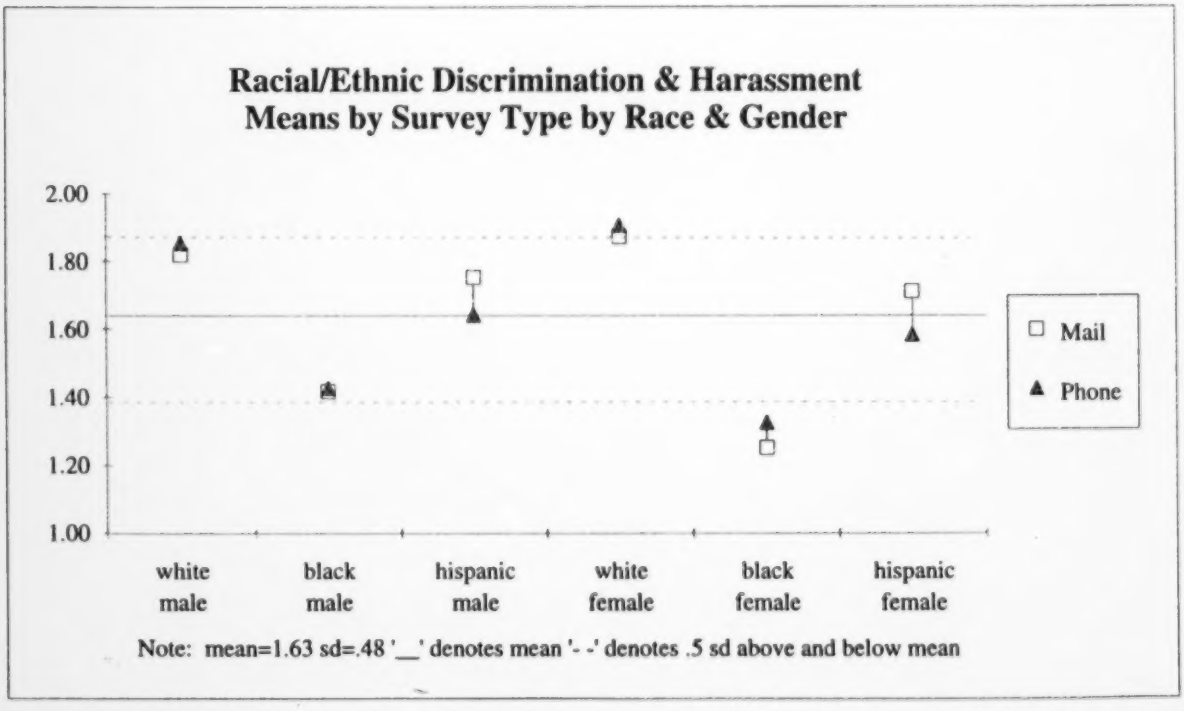


Figure 5



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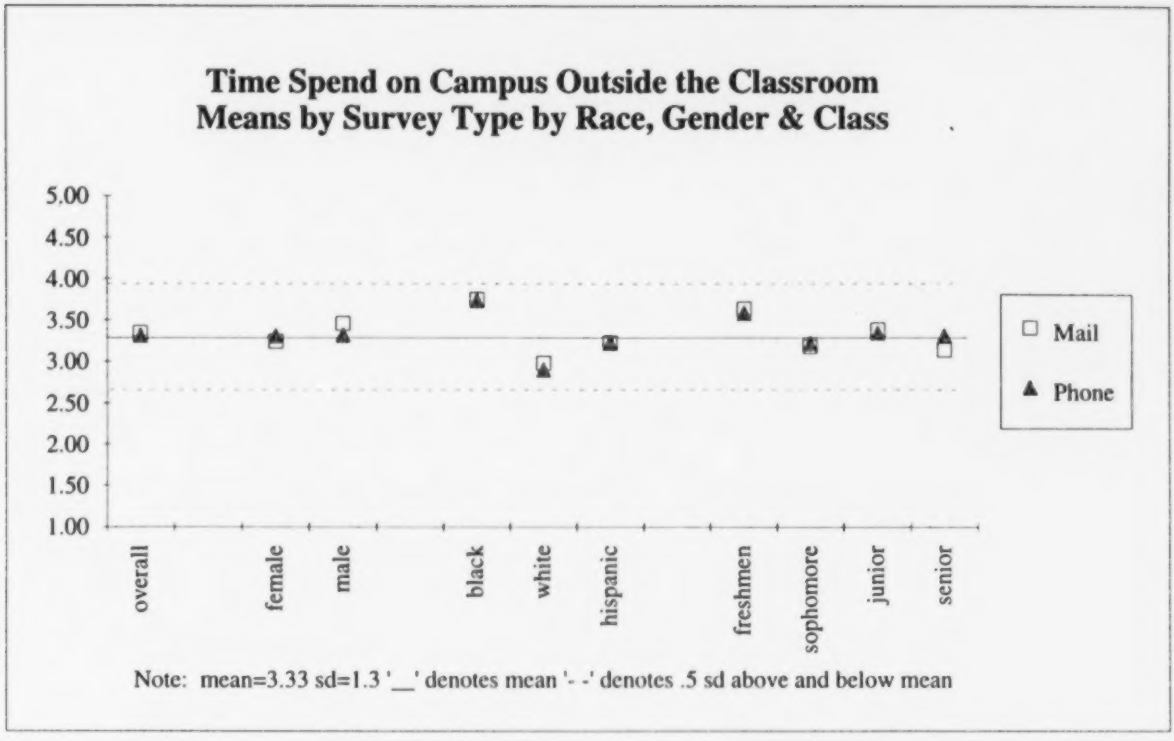

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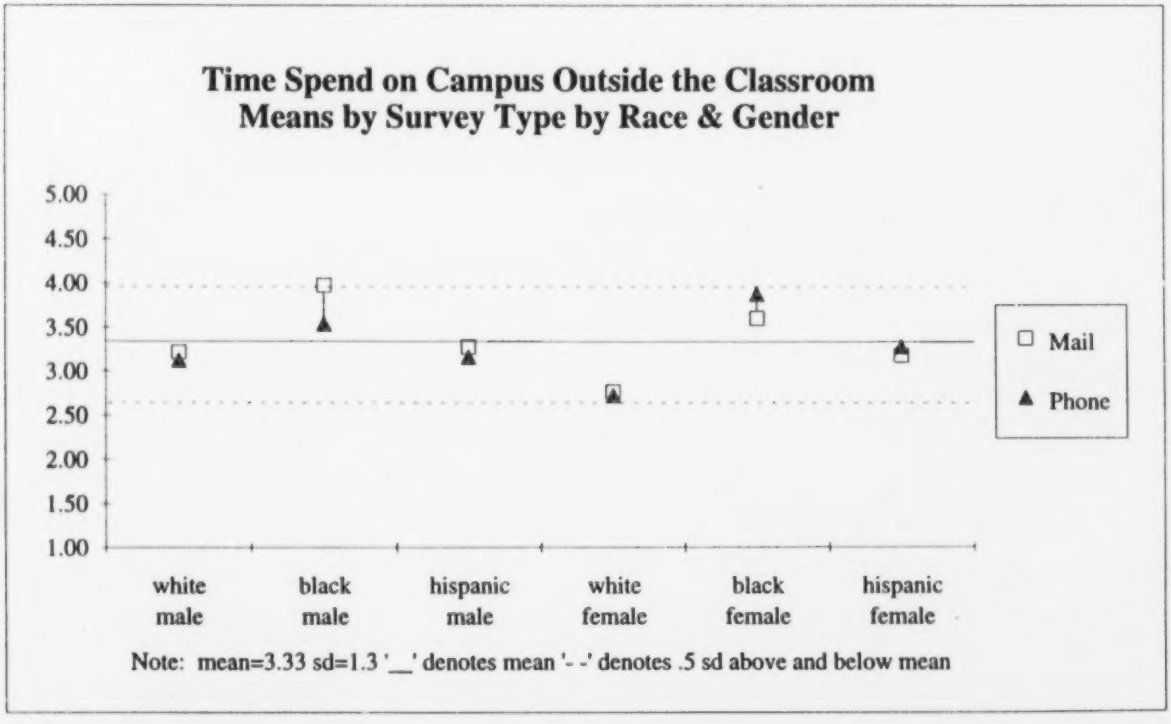

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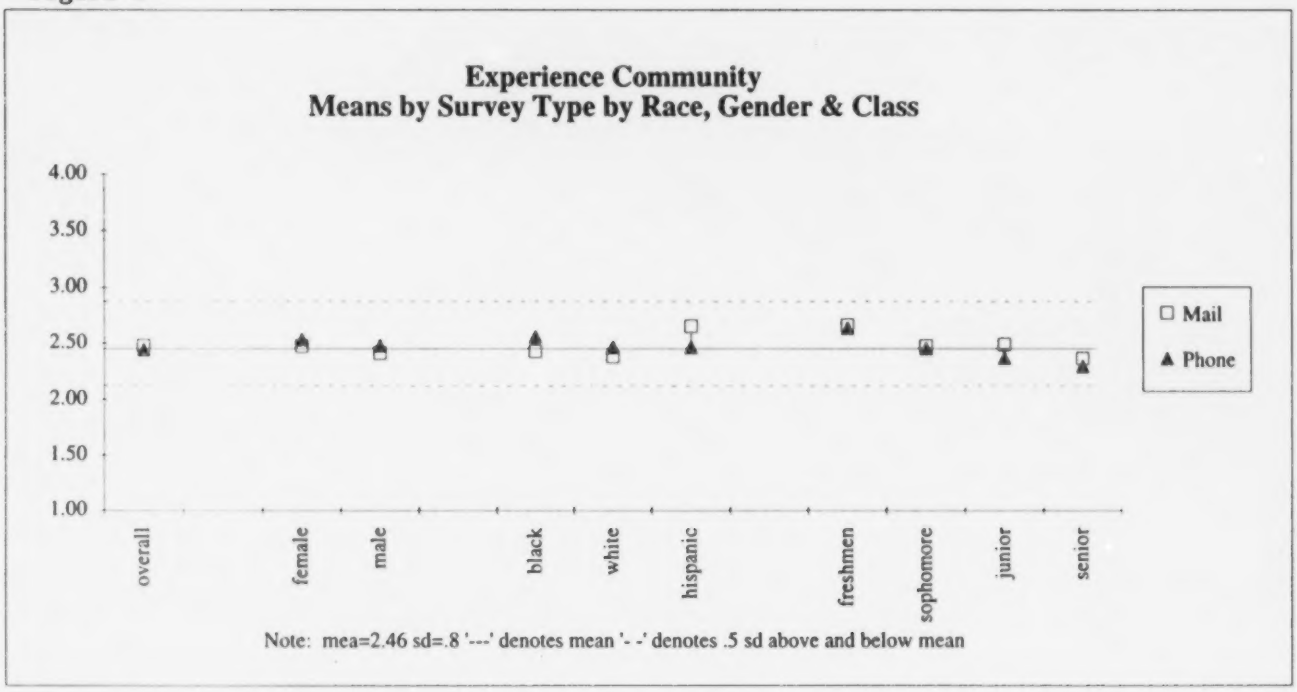

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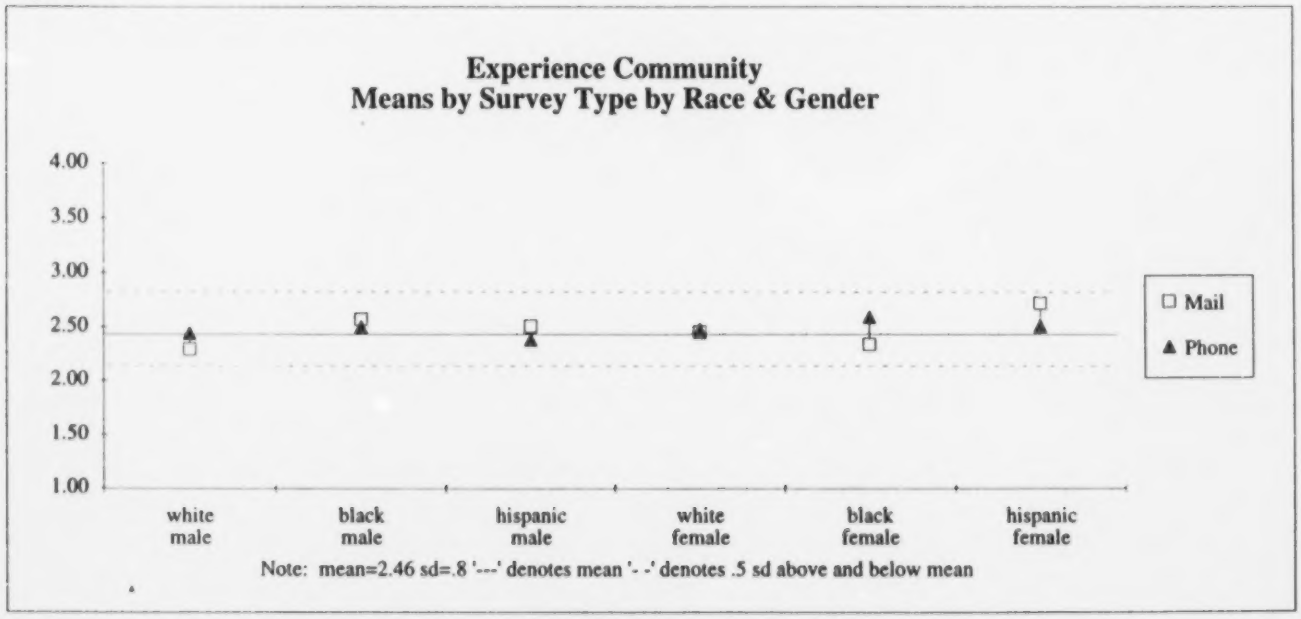

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Figure 10

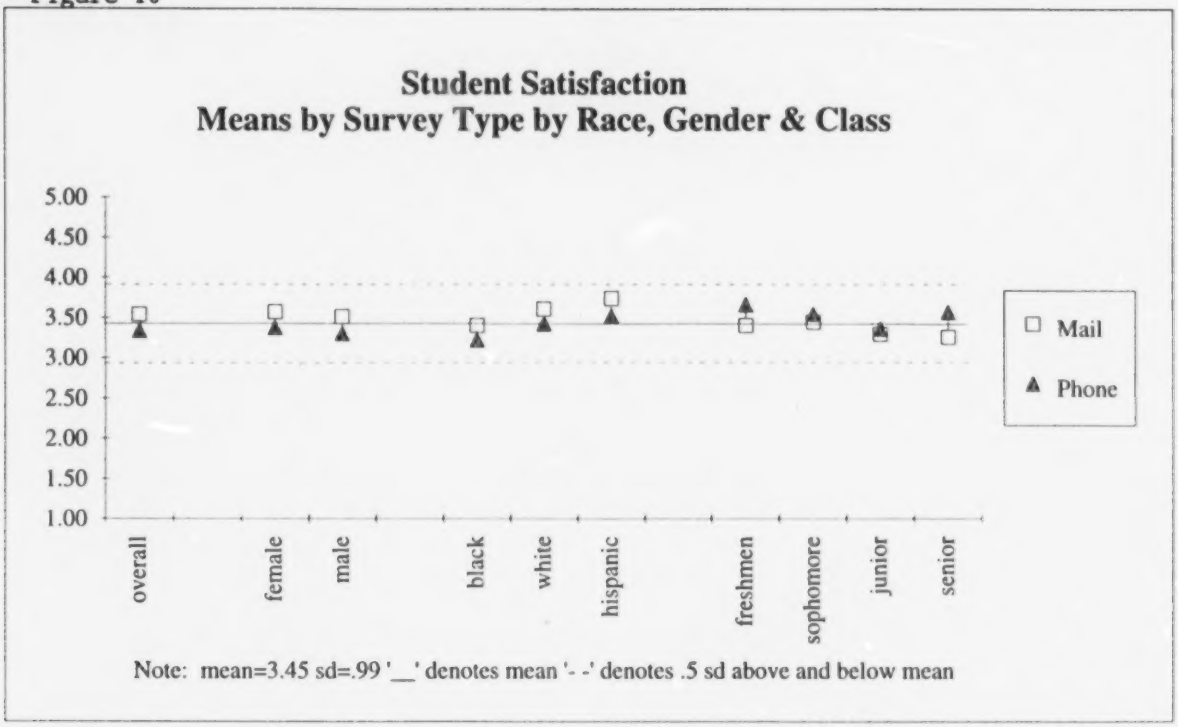

Figure 11